Post-operative surgical wound infections with special reference to methicillin resistant *Staphylococcus aureus*: an experience from vims hospital, Ballari.

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ABSTRACT:

**Background and objectives:** *Staphylococcus aureus* is frequently isolated from post-operative surgical wound infections, which may serve as nidus for the development of systemic infections. Strains of methicillin resistant *Staphylococcus aureus* (MRSA) have become established as the prevalent strains in hospitals.

**Materials and methods:** Pus samples were processed for routine microscopy and culture and the organisms were identified by standard methods and antibiotic sensitivity testing was done. Methicillin Resistance in *Staphylococcus aureus* isolates were tested by using cefoxitin disc diffusion test (30 mcg).

**Results:** A total of 112 pus samples from the clinically suspected post-operative wound infection from various departments were collected and processed in the department of Microbiology, during the study period. The most common microorganism isolated was *Staphylococcus aureus* (31.3%), followed by *E.coli* (26.1%), *Pseudomonas sp* (18%) and others. In the present study, cefoxitin disc susceptibility revealed that 28.6% isolates were Methicillin Resistant *Staphylococcus aureus* (MRSA). The overall drug resistance was more in MRSA isolates compared to MSSA.

**Conclusion:** The regular surveillance of hospital associated infections including monitoring of antibiotic sensitivity pattern of MRSA and formulation of definite antibiotic policy may be helpful for reducing the incidence of MRSA infection.

1. INTRODUCTION

Post-operative surgical wound infections are considered as the commonest nosocomial infections after urinary tract infections and are responsible for the increasing cost, morbidity and mortality related to surgical operations accounting for 14 – 16% cases [¹]. Surgical wound infection is a most common post-operative complication and causes significant post-operative morbidity and mortality, prolongs hospital stay and adds between 10% - 20% to hospital costs [²]. The risk of developing a surgical site infection depends upon the balance between factors determining the number of bacteria contaminating the site and the factors determining the resistance of the site against infection [³].

Post-operative wound infection results from bacterial contamination during or after a surgical procedure [⁴]. It can occur from first day onwards to many years after an operation but commonly occurs between the fifth and tenth days after surgery [⁵] and can cause life threatening postoperative complication. Most surgical site infections are caused by contamination of an incision with microorganisms from the patient’s own body during surgery. Infection caused by microorganisms from an outside source following surgery is less common. The majority of surgical site infections are preventable. Measures can be taken in the pre-, intra- and postoperative phases of care to reduce risk of infection [⁶].

*Staphylococcus aureus* is frequently isolated from post-surgical wound infections, which may serve as nidus for the development of systemic infections [⁷]. Strains of methicillin resistant *Staphylococcus aureus* (MRSA) have become established as the prevalent strains in hospitals [⁸]. MRSA has become the “bug-bear” of modern surgical practice [⁹]. Increased frequency of MRSA in hospitalized patients and possibility of Vancomycin resistance requires permanent control of MRSA spread in the hospital [¹⁰].
Hence, this study was undertaken to know the prevalence of Methicillin resistance among *S. aureus* isolates at tertiary care teaching hospital. The pattern of antibiotic susceptibility of both methicillin sensitive and methicillin resistant isolates to the commonly used antimicrobial agents was also analyzed.

### 3. MATERIALS AND METHODS

The present retrospective study was conducted in the Department of Microbiology, Vijayanagar Institute of Medical Sciences, Bellary, Karnataka during the period January 2012 to December 2012. Pus swabs/specimens were collected from infected surgical sites by standard technique using commercially available sterile swabs. All the specimens were processed by Gram’s stain and inoculated onto blood agar and Mac conkey agar within two hours of collection. The agar plates were incubated at 37°C aerobically and examined for the presence of any growth after overnight incubation. Those plates showing no growth were further incubated up to 48 hours [3].

The isolates were identified by colony morphology, Gram’s stain and biochemical reactions and antibiotic susceptibility tests performed by CLSI recommended by Kirby-Bauer disc diffusion method [8].

Methicillin Resistance in *Staphylococcus aureus* isolates were tested by using cefoxitin disc diffusion test (30 mcg). All isolates were subjected to cefoxitin disc diffusion test using a 30µg disc. A 0.5 Mc Farland suspension of the isolate was made and lawn culture done on Mueller Hinton Agar (MHA) plate. Plates were incubated at 30°C for 18 h and zone diameters were measured. An inhibition zone of ≥ 20 mm was considered as susceptible and ≤ 19 mm resistant for cefoxitin [11].

Following antibiotic discs were included for all methicillin resistant Staphylococci strains.

1) Vancomycin 30µg  
2) Linezolid 30µg

### 4. RESULTS

Out of 112 cases suspected of post-operative surgical wound infections from various departments like surgery, orthopedics and obstetrics & gynecology, 82 cases were male and 30 female cases. The percentage in present series is 73.2% for males and 26.8% for females. (Graph.1)

Out of 112 clinically suspected cases of post-operative wound infections, 104 cases showed culture positive and 8 cases were culture negative. From 104 culture positive cases 134 bacterial isolates were isolated. Among 134 isolates the most common was *Staphylococcus aureus* 42(31.3%), followed by *E.coli* 35(26.1%), *Pseudomonas sp* 24(18%), *CONS* 11(8.2%), *Klebsiella spp.* 6(4.5%), *Proteus sp.* 5(3.7%), *Enterobacter sp.* 4(3%), *Streptococcus sp.* 3(2.2%), *Citrobacter freundii* 2(1.5%), *Enterococcus sp.* 2(1.5%). (Table.1)

Cefoxitin disc sensitivity done on Muller-Hinton agar revealed that 12(28.6%) isolates were Methicillin Resistant *Staphylococcus aureus* (MRSA), 30(71.4%) were Methicillin Sensitive *Staphylococcus aureus* (MSSA) (Graph.2)

In this study, it showed that from the surgery department 30% MRSA were isolated followed by obstetrics & gynecology 28.8% and orthopedics 26.7%. (Graph.3)

In this study, MRSA isolates showed 100% resistance to Ampicillin whereas MSSA isolates showed 83.3% resistance.
Graph.1
Sex-wise distribution of post-operative wound infections

Graph.2
Showing methicillin sensitivity

Graph.3
Department-wise distribution of methicillin resistant Staphylococcus aureus (MRSA)
### Table. 1

**Organism-wise distribution of post-operative wound infections**

<table>
<thead>
<tr>
<th>ORGANISMS</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>42 (31.3)</td>
</tr>
<tr>
<td><em>E. coli</em></td>
<td>35 (26.1)</td>
</tr>
<tr>
<td><em>Pseudomonas sp.</em></td>
<td>24 (18.0)</td>
</tr>
<tr>
<td>CONS</td>
<td>11 (8.2)</td>
</tr>
<tr>
<td><em>Klebsiella sp.</em></td>
<td>6 (4.5)</td>
</tr>
<tr>
<td><em>Proteus sp.</em></td>
<td>5 (3.7)</td>
</tr>
<tr>
<td><em>Enterobater</em> spp.</td>
<td>4 (3.0)</td>
</tr>
<tr>
<td><em>Streptococcus</em> spp.</td>
<td>3 (2.2)</td>
</tr>
<tr>
<td><em>Citrobacter freundii</em></td>
<td>2 (1.5)</td>
</tr>
<tr>
<td><em>Enterococcus</em> spp.</td>
<td>2 (1.5)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>134 (100)</td>
</tr>
</tbody>
</table>

### Table. 2

**Antimicrobial sensitivity patterns of methicillin-resistant *S. Aureus* (MRSA) and methicillin susceptible *S. aureus* (MSSA) Strains (%) sensitivity**

<table>
<thead>
<tr>
<th>ANTIBIOTICS</th>
<th>MRSA %</th>
<th>MSSA %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>0</td>
<td>16.7</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>50</td>
<td>63.3</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>16.7</td>
<td>43.3</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>33.3</td>
<td>60</td>
</tr>
<tr>
<td>Co-trimoxazole</td>
<td>33.3</td>
<td>56.7</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>41.7</td>
<td>56.7</td>
</tr>
<tr>
<td>Amikacin</td>
<td>83.3</td>
<td>90</td>
</tr>
<tr>
<td>Ceftriazone</td>
<td>25</td>
<td>53.3</td>
</tr>
<tr>
<td>Amoxyclav</td>
<td>16.7</td>
<td>80</td>
</tr>
<tr>
<td>Linezolid</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Among MRSA isolates 83.3% resistant to Amoxyclav and Doxycycline, Erythromycin and Ceftriazone showed 75% resistance and Ciprofloxacin and Co-trimoxazole showed 66.7% resistance. Overall the drug resistance was more in MRSA isolates as compared to MSSA. Linezolid and Vancomycin (100%) exhibited excellent activity against both MRSA and MSSA. The other antibiotic which was found to be effective against MRSA was Amikacin(90%). (Table.2)

### 5. Discussion

Methicillin-resistant *Staphylococcus aureus* (MRSA) have become increasingly prevalent worldwide. Due to an increasing number of infections caused by methicillin-resistant *S. aureus* (MRSA) strains, which are now most often multiresistant, therapy has become problematic [12][13]. MRSA spreads by direct physical contact or transmitted indirectly by contact with towels, clothes etc. surgical patients are at risk of infection if they are
colonized with MRSA or if MRSA is inoculated into their surgical wound by contaminated hands or instruments including dressing scissors [9].

In this study out of 112 cases majority were from surgery department (58%) followed by orthopaedics (31%) and obstetrics & gynaecology (11%). Perforation closure (28.5%) and open fractures (26.8%) were the most common surgical procedure showed maximum infection rate.

*Staphylococcus aureus* (31.3%) was the predominant isolate from surgical wound infections from our hospital, which is comparable to other studies from India [3][14][15]. The predominance of *S.aureus* seen in this study is most likely associated with endogenous source as the organism is a member of skin and nasal flora of the patients [5].

In the present study, cefoxitin disc susceptibility revealed that 12(28.6%) isolates were Methicillin Resistant *Staphylococcus aureus* (MRSA), 30(71.4%) were Methicillin Sensitive *Staphylococcus aureus* (MSSA); predominant isolates were MSSA. 28.6% of isolates were MRSA in our study, which is consistent with average Indian data [16]. Similar study was conducted by Jyothi Sonawane et al [15] which shows 27.85% of MRSA isolates.

In this study, Linezolid and Vancomycin exhibited excellent activity against both MRSA and MSSA. The other antibiotic which was found to be effective against MRSA was Amikacin(90%). Another observation that was made in our study was that MSSA strains were generally sensitive to most of the antibiotics tested as compared to MRSA isolates. Mulla S et al [17] also observed in their study that multidrug resistance was more common in MRSA than MSSA. In our study, amikacin sensitivity among the *S.aureus* was still high in comparison to the findings from other part of the country. The sensitivity to amikacin was noted in 83.3% and 90% of MRSA and MSSA strains respectively. Several other studies have reported all the *Staphylococcal aureus* isolates being 100% sensitive to vancomycin and linezolid [13][15][16] which was comparable with our study. Overall the drug resistance was more in MRSA isolates as compared to MSSA.

6. CONCLUSION

MRSA infections are generally multidrug resistant and their therapy entails a huge financial drain on hospital resources. The regular surveillance of hospital associated infections including monitoring of antibiotic sensitivity pattern of MRSA and formulation of definite antibiotic policy may be helpful for reducing the incidence of MRSA infection.

7. REFERENCES:

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